SYLLABUS
Design Fundamentals
ChBE 403 Fall 2018

Course Description

Product and process design fundamentals. Economic analysis. Use of modern simulation tools for chemical engineering design.

Course Prerequisites

Prerequisites: ChBE 390,402,412

Class Schedule

Lectures: MWF at 11am Brockman Hall 101
Simulation Tutorials: 2 hours sessions in OEDK Computer Lab or AEL SDL
Coaching Sessions for Presentation and Writing by Appointment
Team Meetings with Instructors (See Project Statement)

Instructors

Kenneth R. Cox
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Teaching Assistants

Jaron Chen
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Required Textbooks

- "Product and Process Design" by Seider, Seader, and Lewin
- "Chemical Engineering Design" by Towler and Sinnott (electronic edition available at Fondren)

Recommended Textbook

- "Perry's Chemical Engineers' Handbook", (available for free on AIChE Knovel e-Library)

Canvas

Please consult the ChBE 403 Canvas site regularly for announcements, lecture notes, resources, and homework assignments. You are responsible for reading all of the Canvas announcements in a timely fashion. Most homework assignments will be announced through Canvas, so be sure to read any email sent from this Canvas site.

Homework and Exams

Typically seven homeworks will be assigned. The assignments and solutions will be posted to this Canvas site. There will be two timed in-class exams and possibly several quizzes. All exams and quizzes are pledged individual assignments as defined by the Rice Honor Code. Any number of quizzes may be given during the semester.

Honor Code Policies

Students are encouraged to talk to each other, the teaching assistants, the instructor, or anyone else about any homework assignment in the course that is not specifically designated as pledged. This assistance is limited to the discussion of the problem and perhaps sketching of a solution.

All reports are treated the same as pledged exams. You may not consult with members of other teams in any way about your reports. You may not receive help from anyone outside of your team with the exception of the instructor and the TA's, unless you obtain permission from the instructors in advance. You may not consult reports from previous ChBE courses. Putting your name on a report for which you made no contribution is an honor code violation. It is claiming someone else's work as your own.

For all assignments, consulting another student's solution (even from a previous ChBE 403 or 404 class) is prohibited, and submitted solutions to assignments may not be copied from any source.

The quizzes and attendance sheets are covered by the Rice honor code policy, and as such it is a violation of the honor code policy to misrepresent your signature or the signature of another student on a quiz or attendance poll. Do not sign for another student. You may not warn students of a quiz by electronic devices. Any student not present at the beginning of an unannounced quiz will not be permitted to participate.

Information about the Rice Honor System can be found at http://honor.rice.edu/

Team Design Project

One team project will be assigned this semester. In the course of this project, you will be required to attend meetings with instructors and coaches. At these meetings, you will present the results of your project to date. The final results will be communicated through both oral presentation and written reports. All reports must be submitted both electronically and in hard copy. The text in any electronic submissions must be machine readable (generally in .doc or .docx formats). There should be no collaboration between project teams. No help may be provided by individuals outside Rice University. Further discussion of honor code requirements for projects will be discussed in class and posted under the resource section of this Canvas site.

All students are required to participate actively on the team project. A student who makes little contribution to the team project may be heavily penalized by the instructors. A deduction as large as ten percent of the course grade may be taken for lack of participation determined largely on peer review collected at the end of the semester. Any one who does not contribute a fair share of effort can expect a zero score for this component of the grade. Placing your name on a report implies active participation on the team. Failure to participate in the final presentation or report can result in

a zero grade for the entire team design project.

Plagiarism

Copying from any source without proper citation is plagiarism. Plagiarism is a serious honor code violation.

Grade Distribution

55% Exams and Quizzes
30% Team Project and Participation
15% Homework

Late Penalties

All assignments are expected to be submitted no later than the posted deadline, unless an extension is approved well in advance by the instructor.

Any assignment submitted later than the posted deadline will receive a penalty of 10%. For each 24 hours after the posted deadline, an additional 10% penalty will be added.

Attendance

In accordance with the policy stated in the general announcements, attendance is required. Attendance at all lectures, exams, and tutorial sessions are important for successful completion of this course. If any extenuating circumstances prevent your attendance, you are expected to notify the instructor by email in advance. If you do not receive a return email confirming agreement, you must contact the instructor by other means. If medical or other circumstance make advance notification impossible, you are expected to submit justification for your absence in writing. Unexcused absence will result in a zero score for any quizzes and a potential reduction in participation grade. Attendance may be spot checked by quiz. Those excused from class are still responsible for all handout and lecture materials.

Regrades

Requests for regrades must be submitted in writing no later than one week following the return of an assignment. Any regrades will involve the entire assignment, and will not be limited to the specific questions raised in the regrade request. The detailed regrade policy is posted under the policy file in the resource section of this Canvas site. Do not complain about a grade to the TA's or expect them to change your score. The TA's are not authorized to make changes in scores.

Participaton

Active participation is expected in all class activities. Lack of participation, particularly in team assignments, will result in reduction of your participation grade. Feedback from your team members will be an important component of your participation grade. Details will be explained in class.

Course Objectives

1. Learn how to use commercial simulation packages for designing major components of chemical plants
2. Learn how to apply economics and optimization techniques to the design of new products and equipment
3. Learn fundamentals of chemical engineering equipment design
4. Learn strategies for developing separation processes
5. Further develop skills for technical communications in a team environment

Course Outcomes

The student taking this course will learn to

1. Design (size and cost) major types of equipment found in chemical plants
2. Make an economic analysis of alternative equipment
3. Simulatate a chemical process using a commercial process simulator
4. Learn to Use Engineering Heuristics and Shortcut Approaches
5. Write a persuasive report and give a persuasive presentation addressed to a mixed management/technical audience

Topics Covered

- Separation System Synthesis (Distillation and Membranes)
- Thermal Energy Exchange (Heat Exchangers, Reboilers, and Condensers)
- Mechanical Energy Exchange (Pumps, Compressors, Turbines, and Turbo-expanders)
- Review of Thermodynamics for Process Simulation
- Use of Chemical Process Simulators
- Heuristics for Process Synthesis
- Capital Cost Estimation
- Process Analysis and Design Constraints

Material Covered by Exams and Quizzes

You are responsible for all material covered by the lectures, assigned reading material, handout and posted materials, and homework assignments. Not all of the lecture content will be covered in posted notes, so attendance and good notetaking is essential to your success in this course. The lectures are designed to compliment the reading assignments, not replace them. You are expected to be thoroughly familiar with all of the readings assigned.

Software

All software you use in support of required assignments must be readily available on campus to all Rice students and the instructional staff. The version of the software used must be compatible with the version installed on the Rice University computers.

Audio and Video Recording Policy

Audio and video recordings, if not carefully regulated, may infringe on intellectual property rights, compromise privacy rights of the students, or disrupt the learning environment of the classroom. Generally classrooms are expected to be safe havens for free exchange of ideas. Intellectual property and student privacy are both protected by federal law.

While such recordings are discouraged in ChBE 404, they are not prohibited. However, anyone

making such recording must follow guidelines that protect the interests and legal rights of their classmates, the instructors, and the university. All relevant university rules must be followed when making any recording.

As a matter of policy, the content of any electronic recording taken during class is restricted to personal use only, unless an exception is made in writing by the course instructor and by all other individuals captured (in either audio or video format) during the recording. This personal use is solely for the benefit of the person making the recording and only for the purpose of study in the current course. These recordings must not be distributed or shared in any form, in whole or in part, without permission of the instructor.

Special Needs

Any student with a documented disability needing academic adjustments or accommodations is requested to talk with the instructor during the first two weeks of class. All discussions will remain confidential. Students with disabilities will also need to contact Disability Support Services in the Ley Student Center.

Information Contained in This Syllabus

The information contained in this course syllabus, other than the absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.